

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 21-32 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

- In claim 21, "said light-emitting layer being devoid of an intentional impurity" is not disclosed in the specification. Therefore, this is new matter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowers et al. (US 5,985,687).

With regard to claims 21-24, Bowers et al. discloses a method of manufacturing a light-emitting device, LED (col. 3, line 60 to col. 9, line 40 and fig. 10) comprising forming a light-



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09/711,908	11/15/2000	Norikatsu koide	PM268415	8191

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EXAMINER

LOUIE, WAI SING

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 05/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/711,908

Applicant(s)

KOIDE ET AL.9

Examiner

Wai-Sing Louie

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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emitting layer 56 comprised of InGa_xN over a sapphire substrate 14 (col. 7, lines 40-48 and fig. 4a). Bowers et al. disclose the In_xGa_{1-x}N light-emitting layer having an indium mole fraction of 0.15 (col. 7, line 65), but Bowers et al. do not disclose the light wavelength λ (nm) = 1239.8/E_g (eV) and has an energy level $E_g \leq 3.4*(1-x) + 1.95*x - 4.26*x*(1-x)$. However, Bowers et al. disclose the LED emits a blue light, operating in a 300-700 nm range (col. 1, lines 17-20). Calculating the E_g with above formula, where E_g is smaller than 2.64 and calculating the wavelength λ is about 470 nm (see calculation in fig. 10). Bowers et al. disclose the active region is a multiple quantum well 56 including an In_{0.15}Ga_{0.85}N wells and an In_{0.05}Ga_{0.95}N barriers (col. 7, lines 64-67). Although, Bowers et al. do not disclose the well layers is devoid of an intentional impurity, but it is well know in the art that a well layer in the MQW is not doped (devoid of impurity) to create the carriers confinement region in the MQW.

Claims 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowers et al. (US 5,985,687) in view of Shakuda (US 5,557,115).

With regard to claims 25 and 26, Bowers et al. disclose the LED emits a blue, green, and yellow lights, operating in a 300-700 nm range (col. 1, lines 17-23), but Bowers et al. do not disclose another range of indium mole fraction of 0.19 to about 0.26. However, Shakuda teaches that the mixture ratio of Indium to Gallium in the light-emitting layer increases, the wavelength of the light generated at this layer also increases (Shakuda col. 4, lines 27-29). The LED can be made to emit light of different color such as green (Shakuda col. 6, lines 59-61). Therefore, it would have been obvious at the time the invention was made to modify Bowers et al. with the

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teaching of Shakuda to set the indium mole fraction of 0.19 to about 0.26 in order to generate green light at the range from 510 to 530 nm.

Claims 27 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowers et al. (US 5,985,687) in view of Watanabe (US 5,537,433).

With regard to claim 27, Bowers et al. disclose the method of manufacturing the LED (fig. 10) comprising:

- Disposing a buffer layer 16 on the sapphire substrate 14, but do not disclose the buffer layer comprises AlN. However, Bowers et al. disclose the device is made of (In, Ga, and Al) nitride (col. 3, line 61). AlN buffer layer is commonly used in the art such as disclosed in Watanabe's device (Watanabe fig. 15). Therefore, it would have been obvious to provide an AlN buffer layer in Bowers' device;
- Interposing a first clad layer 54 between the buffer layer and the light-emitting layer, but do not disclose the first clad layer comprises n-GaN. Bowers et al. disclose the device is made of (In, Ga, and Al) nitride (col. 3, line 61). N-GaN clad layer is commonly used in the art such as disclosed in Watanabe's device (Watanabe fig. 15). Therefore, it would have been obvious to provide an n-GaN Clad layer in Bowers' device;
- Forming a second clad layer 52, but Bowers et al. do not disclose the p-GaN layer is doped with magnesium. However, Bowers et al. disclose the device is made of (In, Ga, and Al) nitride (col. 3, line 61). P-GaN clad layer is commonly used in the art such as disclosed in Watanabe's device (Watanabe fig. 15). Therefore, it

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would have been obvious to provide a p-GaN Clad layer in Bowers' device.

Bowers et al. disclose p-type dopant is magnesium (col. 8, line 38).

With regard to claim 32, in accordance with claim 27, Bowers et al. disclose the layers are grown as crystal by a metal organic vapor phase epitaxial growth method with nitrogen, ammonia, trimethyl gallium, and TMGA gases (col. 5, lines 34-40).

Claims 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowers et al. (US 5,985,687) in view of Ishikawa et al. (US 5,977,565).

With regard to claim 28, Bowers et al. do not disclose depositing a p-side electrode 306, which is transparent and is made of gold. However, Ishikawa et al. disclose the electrode 107, which is transparent and is made of gold (col. 6, lines 63-65). Ishikawa et al. teach the transparent gold electrode layer would increase the light-emitting area (col. 7, lines 1-4). Thus, it would have been obvious at the time the invention was made to modify Bowers' device with the teaching of Ishikawa et al. to have a transparent electrode layer in order to transmit light through a larger area.

With regard to claims 29 to 31, Bowers et al. do not disclose an interposing layer comprising p-AlInGa_N, which has a formula of $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$. However, Ishikawa et al. disclose second cladding layer 104 is p-In_xAl_yGa_{1-x-y}N (Ishikawa col. 8, line 46) and third cladding layer 126 of p-GaN (fig. 5). One with ordinary skill in the art would have an interposing layer, which acts as a carrier confinement layer. Therefore, it would have been obvious at the time the invention was made to modify Bowers' device with the teaching of Ishikawa et al. to

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have an interposing layer in order to confine the carrier toward the active layer. Bowers et al.

disclose p-type dopant is magnesium, which is a Group IIA element (col. 8, line 38).

Response to Arguments

Applicant's arguments with respect to claims 21-32 filed 5/25/02 have been fully considered, but are moot in view of the new ground(s) of rejection above.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474.

The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

wsl
April 25, 2003


LONG PHAM
PRIMARY EXAMINER